PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference PU030134	FOR FURTHER ACTION	
		See Form PCT/IPEA/416

International application No. PCT/US2004/005690	International filing date (day/month/year) 26.02.2004	Priority date (day/month/year) 02.05.2003

International Patent Classification (IPC) or national classification and IPC G03B31/02

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1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

   a. ☒ *sent to the applicant and to the International Bureau) a total of 4 sheets, as follows:*

      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

   ☒ Box No. I   Basis of the opinion

   ☐ Box No. II   Priority

   ☐ Box No. III   Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

   ☐ Box No. IV   Lack of unity of invention

   ☒ Box No. V   Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

   ☐ Box No. VI   Certain documents cited

   ☐ Box No. VII   Certain defects in the international application

   ☐ Box No. VIII   Certain observations on the international application

Date of submission of the demand 28.01.2005	Date of completion of this report 10.08.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Aratari, R Telephone No. +49 89 2399-2855

Box No. I   Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

    ☐   This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
    ☐ international search (under Rules 12.3 and 23.1(b))
    ☐ publication of the international application (under Rule 12.4)
    ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

    Description, Pages

    1-17   as originally filed

    Claims, Numbers

    1-24   filed with telefax on 28.01.2005

    Drawings, Sheets

    1/5-5/5   as originally filed

    ☐   a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☒   The amendments have resulted in the cancellation of:
    ☐ the description, pages
    ☒ the claims, Nos. 25-26
    ☐ the drawings, sheets/figs
    ☐ the sequence listing *(specify)*:
    ☐ any table(s) related to sequence listing *(specify)*:

4. ☐   This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
    ☐ the description, pages
    ☐ the claims, Nos.
    ☐ the drawings, sheets/figs
    ☐ the sequence listing *(specify)*:
    ☐ any table(s) related to sequence listing *(specify)*:

    *   *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. V   Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

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1. Statement

    Novelty (N)   Yes: Claims

                                     No: Claims   1,2,14-15

    Inventive step (IS)   Yes: Claims

                                       No: Claims   3-13,16-24

    Industrial applicability (IA)   Yes: Claims   1-24

                                       No: Claims

2. Citations and explanations (Rule 70.7):

    see separate sheet

Re Item V.

The documents cited in the International Search Report are numbered herein in their order
as **D1** and **D2**.

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1. Independent **claims 1 and 14** are not novel (Art. 33(2) PCT), since **D1** (EP 1 091 573
   A, see figs. 1,2) already discloses a system for restoring audio information from
   variable density film sound tracks (see abstract and paragraphs 5 and 23),
   comprising:-

   i. an optical scanner (1,2,11) for scanning the soundtrack (3) of a film (4) to give
       a digital signal of the audio information (see paragraph 36);

   ii. a storage system (14,17) for storing the digital signal (paragraph 37); and

   iii. a processor (16) for applying at least one statistical processing technique to the
        stored digital signal to restore a characteristic of the audio information
        (paragraphs 45, 49, 52-53)

   iv. in accordance with operator selection of said processing technique.

   The above last-mentioned feature is unambiguously implicit in **D1**, since this
   document mentions that:
   -   the soundtracks may have different kinds of damages (see paragraphs 4, 15,
       17, 20 and 44);
   -   various computer programs are applied to correct or restore the soundtracks
       (paragraphs 15, 39, 59);
   -   both the original and the restored soundtracks are presented to an operator
       (paragraphs 25, 36, 55);
   -   it is possible to "control" the sound and/or video signals from the film
       (paragraphs 40-42);

- damaged potions of the soundtracks have to be identified and/or selected (paragraphs 15, 50).

Therefore, it is manifest that the system of **D1** is to be operated under the supervision of an operator. It is also clear that the various computer programs mentioned in **D1** are of the type which presents the operator with possibility of selecting among various choices, depending on the kind of damages to be restored.

Hence, all the feature of claim 14 are already known from **D1**.

Moreover it is manifest that the system of **D1** functions according to the method of **claim 1**.

It is further observed that in any case it would be extremely obvious to design a system of the type disclosed in **D1** such that an operator would be allowed to select the restoring technique in dependence of the type of damage of the soundtracks. That is, even if the claims 1 and 14 were regarded as novel, they could in no way be considered inventive.

2.   The system of **D1** comprises also a line scan camera (11) (see **claims 2, 15**) and is arranged to carry out any of the statistical operations a)-c) and f) of **claims 3, 16**. Therefore, these claims are not novel either.

3.   The subject-matter of the remaining claims would appear to be obvious (Art. 33(3) PCT) to the skilled person wishing to optimise the system of **D1**.

In particular, it would be obvious to allow an operator to interactively select which particular corrections to the digital data are to be carried out, see point 1 above and **claims 4-5, 17-18**); it would be obvious as well as to provide means for controlling the film-to-camera alignment (see paragraphs 10-13 of **D1**, and **claims 7-11, 20-24**). Correcting for the Gamma curve of the film (see operations d)-e) of **claims 3, 16**) is suggested by **D2** (DE 197 29 201 A, column 3, lines 4-7), which discloses a system of the same type as that of **D1**. Increasing the resolution of the scan camera (see **claims 6, 19**), merely corresponds to applying modern technology to a known device and is, therefore, extremely obvious.

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1   1.   A method for restoring audio information embodied within an analog, optically-
2 recorded variable density soundtrack of a film, comprising the steps of:
3   optically scanning the soundtrack to yield a digital signal representation of the audio
4 information;
5   storing the digital signal;
6   applying at least one statistical processing technique to the stored digital signal to
7 restore at least one characteristic of the audio information in accordance with operator selection
8 of said at least one technique.

1   2.   The method according to claim 1 wherein the optically scanning step further
2 comprises the step of scanning successive lines of the soundtrack.

1   3.   The method according to claim 2 wherein the step of applying the at least one
2 statistical processing technique further includes performing at least one of the following
3 operations:
4   (a) averaging pixel intensities over each scanned line;
5   b) calculating a standard deviation of each pixel in each line scan, eliminating pixel
6 values that deviate above a user defined threshold, and calculating mean to obtain a noise
7 reduced instantaneous amplitude;
8   c) creating a look-up-table to correct for data values derived from non-linear areas of
9 film density transfer characteristic;
10   d) performing statistical and regression analysis of the pixel intensities values to extend
11 beyond non-linear areas of film density transfer characteristic; and
12   e) performing adaptive filtering to minimize effects of inter-modulation distortion.

1   4.   The method according to claim 3 further including the step of performing a
2 plurality of operations.

1   5.   The method according to claim 3 further including the step of performing all of
2 the operations.

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1   6.   The method according to claim 1 further including the step of quantizing the

2   digital signal to at least 12-bit resolution.

1   7.   The method according to claim 2 further including the step of synchronizing the

2   scanning of successive lines to movement of the soundtrack to yield a prescribed number of

3   line scans per unit of time.

1   8.   The method according to claim 2 wherein the step of scanning successive lines

2   of the soundtrack further comprises the step of displacing the film relative to a line scan

3   camera.

1   9.   The method according to claim 8 further including the step of aligning the line

2   scan camera with respect to the soundtrack so that the soundtrack substantially fills a width of

3   the line scan camera.

1   10.   The method according to claim 8 further including the step of azimuth aligning

2   the line scan camera so that equal density values of the soundtrack, when displayed

3   concurrently, appear with substantially equal brightness.

1   11.   The method according to claim 8 further including the step of aligning the

2   soundtrack relative to the line scan camera so that any positional variation of an audio

3   representative envelope of the soundtrack remains within a digital image of the soundtrack.

1   12.   The method according to claim 3 wherein the step of creating a look-up table

2   further includes the step of mapping a linear density value to a mean amplitude value if the

3   mean value falls in a linear range.

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1   13.   The method according to claim 3 wherein the step of performing adaptive

2   filtering includes choosing an empirical filter value A_{ik} in accordance with the formula:

$$A_{ik} = (\sum \beta A_{k-1}Sin(wt_k + \phi) + \beta A_{k-2}Sin(wt_k + \phi) + \beta A_{k-3}Sin(wt_k + \phi) + ... + \beta A_{k-n}Sin(wt_k + \phi)) +$$

3
4    $$(\sum \kappa A_{k+1}Sin(wt_k + \phi) + \kappa A_{k+2}Sin(wt_k + \phi) + \kappa A_{k+3}Sin(wt_k + \phi) + ... + \kappa A_{k+n}Sin(wt_k + \phi))$$

1   14. A system for restoring audio information embodied within an analog optically

2   recorded variable density soundtrack of a film, comprising the steps of:

3   a optical scanner for scanning the soundtrack to yield a digital signal representation of

4   the audio information;

5   a storage system for storing the digital signal;

6   a processor for applying at least one statistical processing technique to the stored digital

7   signal to restore at least one characteristic of the audio information in accordance with operator

8   selection of said at least one technique..

1   15.   The system according to claim 14 wherein the optical scanner comprises a line

2   scan camera for scanning successive lines of the soundtrack.

1   16.   The system according to claim 14 wherein the processor performs at least one of

2   the following statistical processing operations:

3   (a) averaging pixel intensities over each scanned line;

4   b) calculating a standard deviation in each line of scanned data to eliminate extraneous

5   pixel values.

6   c) calculating the standard deviation of each pixel in each line scan, eliminating pixel

7   values that deviate above a user defined threshold, and calculating mean to obtain a noise

8   reduced instantaneous amplitude;

9   d)   creating a look-up-table to correct for data values derived from non-linear areas

10   of film density transfer characteristic;

11   e)   performing statistical and regression analysis of the pixel intensities values to

12   extend beyond non-linear areas of film density transfer characteristic; and

13   f)   performing adaptive filtering to minimize effects of inter-modulation distortion.

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1   17.   The system according to claim 14 wherein the processor performs a plurality of

2   statistical processing operations.

1   18.   The system according to claim 14 wherein the processor performs all of the

2   statistical processing operations

1   19.   The system according to claim 14 wherein the line scan camera yields a

2   quantized digital signal having at least 12-bit resolution.

1   20.   The system according to claim 14 further including means for synchronizing the

2   scanning of successive lines of the soundtrack by the camera to movement of the soundtrack to

3   yield a prescribed number of line scans per unit of time.

1   21.   The system according to claim 14 further including means for displacing the

2   film relative to the line scan camera.

1   22.   The system according to claim 14 further including means for aligning the line

2   scan camera with respect to the sound rack so that the soundtrack substantially fills a width of

3   the line scan camera.

1   23.   The system according to claim 14 further including means for azimuth aligning

2   the line scan camera so that equal density values of the soundtrack, when displayed

3   concurrently, appear with substantially equal brightness.

1   24.   The system according to claim 14 further including means for aligning the

2   soundtrack relative to the line scan camera so that any positional variation of an audio

3   representative envelope of the soundtrack remains within a digital image of the soundtrack.

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